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NEW NORTH AMERICAN SPIROBOLOID MILLIPEDS
OF THE FAMILIES ATOPETHOLIDAE AND
MESSICOBOLIDAE

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The publication of R. L. Hoffman and B. S. Orcutt's synopsis of the family Atopetholidae (1960), putting the disconnected genera in formal keys; giving comparative diagnoses and notes on them, as well as redescribing several of the earlier species in the light of their current knowledge, has greatly facilitated work on this large group whose principal range was then our southwestern tier of States and Mexico. Since 1960 only two species of established genera have been added to the family and these do not materially affect the range or generic concepts.

The species of the order Spirobolida described herein have been accumulating for many years without a treatment having been prepared in which to include them appropriately. It is desirable that they be recognized now since they represent three new genera and a total of seven new species. Several more or less important characters affecting known genera and species have been seen and are mentioned.

All holotype and paratype specimens have been deposited in the myriapod collection of the U. S. National Museum.

FAMILY ATOPETHOLIDAE
SUBFAMILY ARINOLINAE

Uvalida new genus

Type-species: Uvalidia intersecta new species.

Diagnosis: Running to *Arinolus* Chamberlin in Hoffman and Orcutt's key (1960), but males differing especially from *Arinolus* in lacking constricted segments behind segment 1 and having no enlargement at segment 6 or 7. Males differ also in having telopodite of anterior

gonopods hidden from in front by coxite; there is no distal projection for seminal channel of posterior gonopods; the produced coxal lobes of legs 3-7 are broad, thin, and simple.

Description: Body large, its anterior end neither noticeably constricted behind segment 1 nor enlarged at segments 6 and 7 in males.

Head with ocelli in rounded groups separated by less than three times the diameter of one group. Antennae quite slender and barely exceeding posterior margin of segment 1.

Segment 1 strongly emarginate below eye; 1-3 deep striae in posterior surface above lateral angle which much exceeds ventral surface of segment 2. Except at extremities, segments have a transverse constriction containing a slight furrow marking suture between mid- and hindbelts; constriction becoming more obvious in its descent; hindbelt convex with posterior margin thick, the middorsal suture lightly impressed on most segments, lateral suture also impressed. Lateral interstitial ridges not continued behind posterior margin. Pores small, located in or behind the transverse suture at or very little below its intersection with the usually straight, continuous lateral suture except on segment 6 where pore is well below the discontinuous lateral one. Two segments preceding the last one telescoped as far as pores. Last segment of male broadly rounded at apex, in female definitely more angular, surpassed by the inflated anal valves which meet in a very broad, deep groove; preanal scale broadly rounded at apex Claws of legs 1-3 of both sexes decidedly larger than others.

Coxite of each anterior gonopod unusually short, the relative area much less than in any other genus of the family; telopodite hidden behind coxite. Sternum very broad above the basal yoke, its area greater than in other genera. Outer joint of each posterior gonopod thin, simple, and widening from base to apex; seminal tube apparently opening from a short apical trough instead of a separately produced process. Coxae of legs 3-7 produced into broad and thin lobes of which those of fifth legs are broadest; those of seventh legs thickest.

Etymology: Generic name in reference to county where collected.

***Uvaldia intersecta* new species**

Holotype: Male, USNM myriapod collection no. 3296.

Type-locality: Holotype, 2 other males, 1 lacking a moult of maturity, female and several young, Uvalde, Uvalde Co., Texas, 20 November 1911, O. F. Cook.

Description: Holotype 47 mm long, 4.5 mm wide, with 45 segments; other male with 43 segments; female 53 mm long, 6 mm wide, 45 segments.

Head with ocelli in rounded groups of 7-8 rows—3-5-6-7-6-4-2 in holotype; 2-4-5-5-5-5-3 in female. Clypeal fovea 5-5. Antennal joint 2 longest, subequal joints 4 and 5 next, joint 6 shortest, joint 1 decidedly thickest.

Segments 1 and 2 shown in Fig. 1. Body segments without spines at end of ventral striae. Surface of hindbelt finely and sparsely punctate; midbelt less punctate. Segment 7 of male not greatly modified behind gonopods, merely being raised into a straight, low, transverse ridge or swelling.

Gonopods shown in Figs. 2-4. Sternum rather heavily chitinized for a considerable distance of median area above basal yoke, its apex also obviously chitinized. Coxae of legs 3-5 shown in Fig. 5.

Etymology: Latin *intersecta* is in reference to the location of each repugnatorial pore in or near the intersection of the interzonal suture with the lateral sulcus.

Some doubt arose over including the female in this species as pores of the anterior segments are slightly in front of the transverse suture but farther back they are as found in males. Also last segment is quite abruptly rounded behind, differing materially from males. These characters may indicate another species or merely individual or sexual variation within this one.

SUBFAMILY EURELINAE

Centrelius fluvialis new species

Holotype: Male, USNM myriapod collection no. 3297.

Type-locality: Holotype and 2 females, Comstock, Val Verde Co., Texas, March 1911, W. P. Carr.

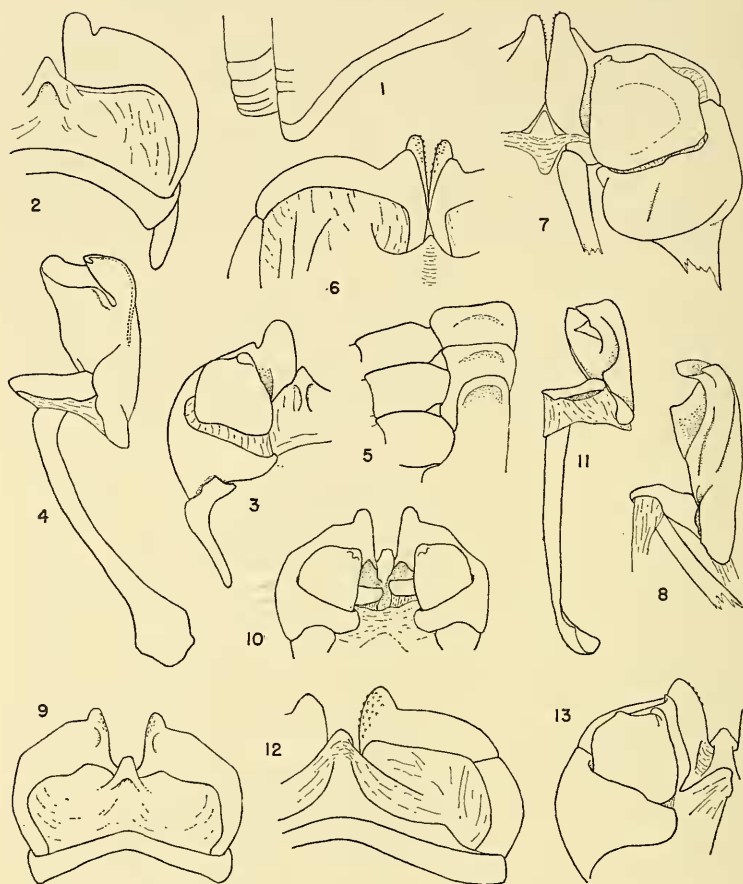
Diagnosis: Distinguished from *C. kerrensis* (Chamberlin) by the more quadrate anterior gonopods, differences of the posterior ones, and of the coxae of male legs 3-7.

Description: Number of segments 50-51, diameter 6.5-7 mm, the specimens broken.

Frontal median sulcus of head much more impressed than that of vertex; clypeal fovea 4-4 and 5-5 in females, 5-6 in male. Eyes sub-triangular rather than rounded, ocelli of male 6-7-7-7-6-4-2, beginning at edge of segment 1, the lower ocellus in first five rows twice the diameter of the upper one. Antennal joints quite evenly decreasing in length from second to sixth, the latter narrowest; only joints 1 and 2 glabrous.

Segment 1 much as in *kerrensis* but the lateral limit produced farther; side above it smooth or with a few striations. On following segments the suture between mid- and hindbelt quite strongly impressed on sides, more lightly so across dorsum; hindbelt gradually elevated behind it to the thickened posterior margin; dorsal median suture impressed across hindbelt but less so across midbelt; lateral suture strongly impressed across hindbelt. The oblique spines terminating the lateral ridges begin on segment 17-20 and do not project on the two preanal telescoped segments where the pores are barely visible in females but not in male; hindbelts of both the telescoped segments much shortened in both sexes.

Last segment evenly rounded at apex, distinctly exceeded by the valves which are broadly convex and meet in a broad deep groove.



FIGS. 1-5. *Uvaldia intersepta* new species. 1, lower side of male segments 1 and 2; 2, right anterior gonopod, anterior view; 3, same, posterior view; 4, right inner gonopod with basal element considerably foreshortened, anterior view; 5, basal joints of male legs 3-5, anterior view. FIGS. 6-8. *Centrelus fluvialis* new species. 6, left anterior gonopod, anterior view; 7, same, posterior view; 8, right inner gonopod, anterior view. FIGS. 9-11. *Comanchelus camporum* new species. 9, anterior gonopods, anterior view; 10, same, posterior view; 11, right inner gonopod, anterior view. FIGS. 12-13. *Comanchelus lobatus* new species. 12, right anterior gonopod, anterior view; 13, same, posterior view.

Preanal scale with an indefinite submedian transverse depression in the essentially flat surface; anterior half smooth, posterior portion variously striate; apex very broadly rounded to almost emarginate.

Gonopods as shown in Figs. 6-8; coxites of anterior gonopods more quadrangular than shown for *kerrensis*, their telopodites (posterior plates) also apparently more quadrate. Ventral ridge of segment 7 transverse, its posterior median portion directed strongly ventrocaudad and hiding the deeply emarginate segmental border.

Legs 1 and 2 of male with claws large and heavy; those of third legs half as long, followed by very short conical ones, a fourth as long, on legs 4-7. Coxal lobes of third legs fully chitinized, broadly spatulate, directed somewhat as described by Hoffman and Orcutt (1960) for *kerrensis* but apparently less caudally bent. Coxae of legs 4-6 about half as high as on third legs, very thin, broad, increasing in width caudad, and rounded-truncate at apex; coxae of seventh legs several times as thick as preceding ones and at least twice as high, evenly rounded at apex.

Etymology: Latin *fluvialis* associates the species with the nearby Rio Grande.

***Comanchelus camporum* new species**

Holotype: Male, USNM myriapod collection no. 3298.

Type-locality: Holotype, a slightly younger male, 3 females found 24 mi. E of Llano, Llano Co., Texas, 4 April 1964, J. C. Loomis.

Diagnosis: Several characters of this species associate it with *Eurelus* Cook but others, particularly relating to the gonopods, more closely approach *Comanchelus*, as exemplified by Hoffman and Orcutt's genotype, *hubrichti*, and accordingly it is placed in this genus. The outstanding characters which associate it with *Eurelus*, however,—the lobed coxae of the anterior male legs and reduced claws of legs 4-7, are not found in *hubrichti*. This mixture of generic characters may require withdrawal of *Comanchelus* into the elder genus, especially since when *Comanchelus* was erected its authors observed that its "two species which although generally similar to *Eurelus soleatus* appear to diverge enough to justify their recognition as a separate group."

Description: Size varying from 40-43 mm long and about 4.5 mm wide, with 45-46 segments; color in life probably slate gray to slightly olivaceous.

Head with surface shining, very sparsely punctate; posterior half of vertex finely sulcate medianly, anterior half smooth; front much more coarsely and deeply sulcate; ocelli 40 or more, in a round patch; clypeal fovea 4-4, 4-5, 4-6, hence possibly 6-6; emargination of clypeus slightly broader than a right angle. Antennae not slender, capable of reaching posterior margin of segment 1; length of joints as in *hubrichti*.

Segment 1 strongly emarginate below lower corner of eye and bounded by a heavy rim; lateral angle acutely rounded, surface above it not

striate but one or two very short rudimentary striae present in posterior margin adjacent to lateral angle of some specimens; surface shining and finely punctate. Outer pleural corner of segment 2 not produced beyond limit of segment 1 and much less acute than in original illustration of *hubrichti*.

Succeeding segments with forebelt finely striate; midbelt evenly and finely short-aciculated lengthwise and with a few tiny punctations intermixed on posterior half; hindbelt more shining and with more and larger punctations but no aciculations; mid- and hindbelts separated by impressed suture in a slight but evident constriction; all sutures between segmental divisions obvious as light lines in dark bodywall; lateral striae adjacent to legs ending in an angulation not produced beyond margin; posterior margin of segments thick and rising abruptly from supplementary margin. Last segment very broadly rounded at apex. Anal valves strongly inflated their anterior halves rugulose-punctate, posterior portions generally smooth and strongly shining. Preanal scale broadly truncated at apex, sides somewhat rounded. Ventral setae on leg joints 1-1-2-2-2-8.

Gonopods as shown in Figs. 9-11.

Male legs 1 and 2 with long heavy claws, three fourths as long on next pair and decreasing thereafter to half as long on seventh pair where they are half as long as on remaining legs. Coxae of third legs caudally produced as long, thin, narrow, subspatulate, distally deflexed lobes slightly notched on outer side near middle, and separating the lobes of both fourth and fifth coxae which are much as described by Hoffman and Orcutt for *E. soleatus*. Seventh coxal lobes quite broad, thick, and high, especially at mesal limit; lobes of sixth coxae broader, thinner, and only about half as high. Third joint of anterior legs not lobed at base; last joint of legs 4-7 imperceptibly flattened dorsally.

Etymology: Latin *camporum* is in reference to the type locality being in the West Texas plains- Llanos (Spanish).

***Comanchelus lobatus* new species**

Holotype: Male, USNM myriapod collection no. 3299.

Type-locality: Holotype, another male, 1910, W. P. Carr; 2 females, April 1911, O. F. Cook; both collections, San Antonio, Texas.

Diagnosis: The posterior gonopods show relationship with *C. hubrichti* from which it may be readily distinguished by the large coxal lobes of the anterior male legs.

Description: Males 53 mm long, 6 mm wide, 45-46 segments; females 53-56 mm long, 7 mm wide, 44 segments.

Eyes with 34-36 ocelli in seven rows, counting from back of head; ocellus nearest lower posterior corner larger than others. Antennae with joint 2 scarcely longer than joint 3; joints 4 and 5 subequal and a little shorter; joint 6 shorter and narrower than inner ones. Frontal area deeply sulcate at middle and with two or three to six or eight coarse transverse striations; vertigial sulcus faint; clypeal fovea 5-5.

Segment 1 deeply and evenly emarginate in front from behind eye to lateral angle; lateral surface with one or two to five or six short striae. Anterior flange of segment 2 not reaching as low as angle of segment 1. Following segments with transverse constriction from which the faintly convex hindbelt is gradually elevated; midbelt finely punctate; hindbelt finely but less punctate above, lower sides with 13 or 14–20 strong striations with intervals ending in rounded but not protruding shoulders. Dorsal suture lightly impressed across hindbelt; second transverse suture lightly impressed across dorsum, more strongly so on sides. Three preterminal segments moderately telescoped in females but more strongly so, and with pores hidden, in males.

Last segment broadly rounded behind and surpassed by anal valves. Anal scale transverse to emarginate at apex, each side emarginate; surface with submedian transverse depression behind which it is slightly swollen and longitudinally striate.

Gonopods as shown in Figs. 12–14; back surface of outer joint of posterior gonopod smooth and shining.

Ventral ridge of male segment 7 nearly flat, its posterior limit high above the deeply emarginate posterior border of the segment; surface strongly striate, the adjacent surface each side with coarse, more or less lunate depressions.

Male legs 1 and 2 with claws long and quite slender; those of third legs about half as long. Coxae of third legs with lobes broad and thick at base, distal half thinned from in front and narrowed inwardly to an erect acute apex rising close to that of opposite lobe. Lobes of coxae 4 and 5 thin, but broader, shorter, subquadrate, highest mesally. Lobes of sixth coxae wider but a little shorter and thicker; those of seventh coxae narrower and shorter than the sixth but considerably thicker, and broadly rounded at apex.

Etymology: Latin *lobatus* is in reference to the large coxal lobes of the anterior male legs.

Mannobolus new genus

Type-species: *Mannobolus peninsularis* new species.

Diagnosis: Most closely related to *Eurelus* but the apical portion of the inner gonopods is thin, simple, decidedly boat-like, and somewhat curved; unusually large basal portion also appears capable of some movement; coxal apodemes absent and possibly broken from both specimens. Claws of anterior male legs reduced in length after the first two pairs but none rudimentary.

Description: Small, rather slender species. Sides of segment 1 sharply narrowed, curving mesad, and somewhat clasping lower portion of mandibular cardo; anterior marginal rim narrow. Segment 2 not reaching lower angle of segment 1. Principal body segments strongly constricted, the constriction lacking an impressed sulcus; pores in midbelt; ridges formed by lateral striae of midbody segments continued

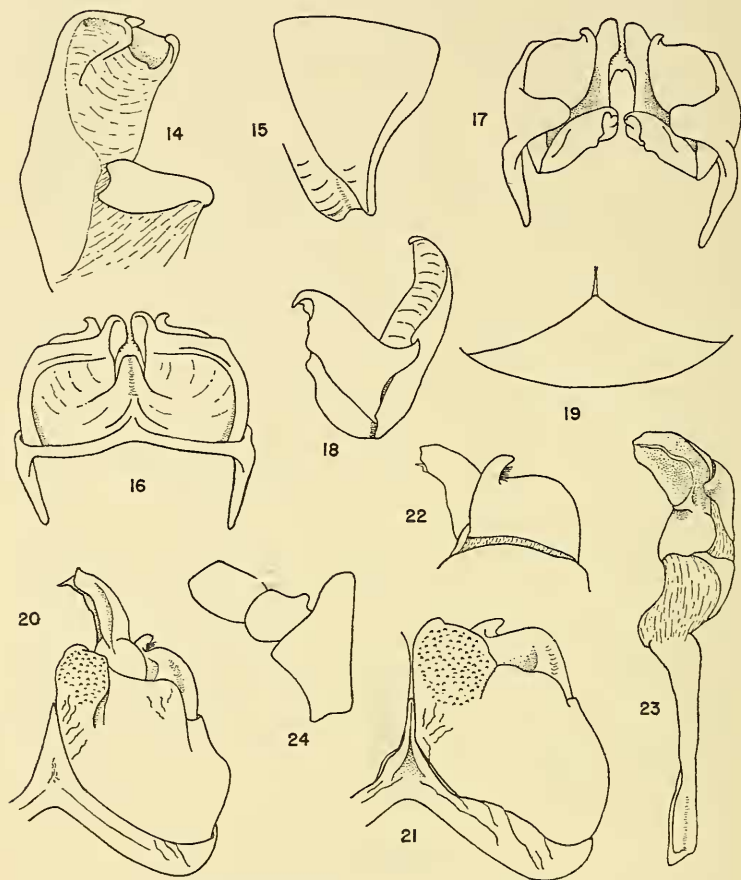


FIG. 14. *Comanchelus lobatus* new species, left inner gonopod, anterior view. FIGS. 15-18. *Mannobolus peninsularis* new species. 15, first and part of second segment, lateral view; 16, anterior gonopods, anterior view; 17, same, posterior view; 18, right inner gonopod, anterior view. FIGS. 19-20. *Petenobolus antiquorum* new species. 19, preanal scale; 20, right gonopods, anterior view. FIGS. 21-24. *Petenobolus mayanus* new species. 21, right anterior gonopod, anterior view; 22, left telopodite of anterior gonopod and inner gonopod, posterior view; 23, right inner gonopod, anterior view; 24, coxa and next two joints of third male leg, posterior view.

as upraised spines behind margin. Two segments before the last strongly telescoped.

Anterior gonopods with tips almost meeting above chitinized apex of sternum which is separated from the basal yoke by a semi-membranous area. Posterior gonopods as in diagnosis.

Coxal lobe of third male legs somewhat as in *Eurelus*, high, thin, the tip bent caudad; lobes of next three legs about half as high, their tips decreasingly bent back; lobes of seventh legs higher than on preceding three pairs, vertical, and at least twice as thick.

Etymology: The generic name combines that of the collector of the species with the suffix of *Spirobolus*, used widely in naming genera within its order.

***Mannobolus peninsularis* new species**

Holotype: Male, USNM myriapod collection no. 3300.

Type-locality: Holotype and another male, both broken, from Comondu, Baja California, February 1923, Wm. R. Mann.

Description: Largest and most badly broken male (holotype) apparently with 46 segments, 3 mm wide; other male 2.8 mm wide, apparently with 41 segments but one or two credited to holotype may belong to this male.

Head with strong median sulcus on vertex widely separated from similarly strong one on front. Clypeal fovea 4-4. Eyes separated by about three times diameter of one eye; ocelli in rows 2-5-6-7-7-6-4, beginning nearest vertigial sulcus, forming round group. Antennal joint 2 distinctly longest, joint 6 narrower and shorter than the subequal intervening ones.

Segment 1 narrowly rimmed along anterior emargination and slenderly angled below (Fig. 15); lower sides curving inward, somewhat clasping lower part of mandibular cardo. From segment 2 or 3 to those telescoped at back end of body a pronounced constriction is evident from base of legs across dorsum but is deepest just above pores which are in its bottom on anterior segments but on its front slope farther back. Lateral suture impressed behind pore across hindbelt; interbelt sutures nowhere impressed. Beginning at about segment 14 or 15, and continuing to caudal segment 5 or 6, four or five ridges formed by the lateral striae are continued beyond margin as obliquely raised spines. Last segment very broadly and evenly rounded behind; considerably exceeded by the broad anal valves which are somewhat flattened behind and meet in a narrow, shallow groove. Anal scale broadly rounded behind except for its nearly straight median portion.

Gonopods shown in Figs. 16-18. Legs 1 and 2 with long, quite slender claws, claws gradually shortening on succeeding legs, only about half as long on sixth legs, broken from seventh legs. Coxae of third legs elevated into thin, basally constricted lobes narrowing distally, the acute tips bent caudad; lobes of fourth and fifth coxae about half a

high with less acute tips decreasingly bent caudad; lobes of sixth legs a little higher, the rounded apex not bent; lobes of seventh legs higher and at least twice as thick as those of legs 4-6, rounded and highest mesally.

Etymology: Latin *peninsularis* alludes to the peninsula of Baja California from which the species came.

FAMILY MESSICOBOLIDAE

Petenobolus new genus

Type-species: *Petenobolus antiquorum* new species.

Diagnosis: Related to *Oxobolus* Chamberlin but easily separated by the acutely angled last segment and preanal scale, and by differences of the gonopods, particularly the broad granular tips of the anterior ones, and the setose tips of their telopodites.

Description: Body large and stout. Head with rounded eyes; outer row of ocelli with one or two at least twice the diameter of ocelli of inner row. Antennae short, crassate, the outer joints noticeably flattened; sense cones 4, in a zigzag line. Clypeal setae 4-4 or 5-5, with an additional one far in front on each side in the angle adjacent to labrum. Labral setae 12 or 13-22. Gnathochilarium widest near apex; mentum swollen at apex, broadly concave below it.

Segment 1 narrowing laterally to an abruptly rounded angle; a heavy rim from angle to lower corner of eye. Segment 2 extending far below 1, as in *Oxobolus*, and deeply excavated in anterior angle. Succeeding segments with sulcus between mid- and hindbelt faintly impressed across dorsum. Pore of segment 6 at level of those following. Surface immediately below each ventral stria extended behind margin as an acute spine, the spines reaching to level of pores on caudal segments. Apex of last segment and of preanal scale subequally acute, the former much exceeded by the anal valves which have prominent thickened margins.

Anterior gonopods large; inner portion of each broad, moderately extended, surface finely and evenly granulate; telopodite with a dense cluster of setae on outer side of apical process. Inner gonopods with outer joint somewhat spoon-like; seminal duct in a longitudinal median ridge along the concave face, terminating in a projecting spur. Coxae of legs 3-6 distally lobed; coxae of seventh legs not lobed or as broad as those preceding. Second joint of some pregenital legs with a rounded tubercle on ventral face adjacent to coxa.

Etymology: Generic name in reference to the Dept. of Peten, in which the species were found, plus suffix of *Spirobolus*.

Petenobolus antiquorum new species

Holotype: Male, USNM myriapod collection no. 3301.

Type-locality: Holotype, Uaxactun, Dept. of Peten, Guatemala, 29 March 1922, O. F. Cook and H. F. Loomis.

Description: Length 84 mm, width 11 mm, with 41 segments; surface of body almost smooth and strongly shining.

Head with eyes more nearly round than triangular or oval; composed of 25 ocelli in rows, 2-4-5-5-5-4, counting outwardly, the two posterior ocelli in outer row largest. Antennae short and stout, a little flattened; joints decreasing in length as follows- 2-3(1-4-5 subequal)-6-7; sense cones in a zigzag row rather than a quadrangle. Frontal sulcus moderately impressed. Clypeal setae five one side, none opposite, a supplementary one in each angle adjacent to labrum; labral setae 7-6. Mandibular stipes and cardo strongly depressed under antennae. Gnathochilarium approximately quadrate; mentum moderately concave, its apex slightly swollen.

Sides of segment 1 narrowed, the lower angle sharply rounded, edge above it emarginate to lower corner of eye. Segment 2 descending well below segment 1 anteriorly, its front and lower margin much thickened, the latter rounded behind without a definite posterior angle; inner surface deeply depressed below and behind angle of segment 1. Last segment ending in an acute angle exceeded by thickened margins of anal valves. Anal scale shown in Fig. 19, its apex resembling that of last segment.

Gonopods as shown in Fig. 20; inner one with apex truncated in lateral view and with a distinct shoulder on outer side near base of joint; seminal spur prominent. Second joint of legs 3 and 4 with a round tubercle ventrally adjacent to coxa; pregenital legs otherwise as in next species.

Etymology: Latin *antiquorum* refers to the fact that the species was found among the ancient ruins of Uaxactun.

***Petenobolus mayanus* new species**

Holotype: Male, USNM myriapod collection no. 3302.

Type-locality: Holotype, consisting of head and next 23 segments, Uaxactun, Dept. of Peten, Guatemala, 29 March 1922, O. F. Cook and H. F. Loomis.

Description: Comparisons throughout this description are with *antiquorum*. Body 12 mm wide. Head with ocelli in rows—2-3-4-5-5-4, the last row with two enlarged ocelli. Frontal sulcus more impressed and extending farther upward, to between antennae which are more flattened, as easily seen in end view of joints; joint 2 noticeably longer, joints 3-5 with basal constriction longer and more obvious. Clypeal setae 4-5; labral setae 9-10. Mandibular stipes and cardo only moderately depressed. Gnathochilarium obviously broader than long; mentum more concave, apex more strongly swollen. Anterior rim of segment 1 more sharply limited behind by a deeper furrow; front margin straighter; lateral angle not as narrow. Segment 2 with depression under segment 1 deeper; anterior angle a little more abruptly rounded; ventral margin straighter and ending in a slight but noticeable angula-

tion with the posterior margin, the thickened ventral margin flatter and less sharply defined.

Gonopods shown in Figs. 21-23; inner gonopod with outer joint more continuous with basal one, lacking a lateral shoulder, apex more rounded, seminal spur smaller and less protruding. Coxae of third legs produced into conic lobes; legs 4 and 5 with broader and less produced lobes; legs 3-6 with a rounded tubercle on ventral face of joint 2 adjacent to coxa (Fig. 24).

Etymology: *Mayanus* is in allusion to the Mayan inhabitants of the country where the species was collected.

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